

Random Access Magnetic Drums & Discs

DRUM STORAGE UP TO 4,100,000 BITS, 3 MODELS • DISC STORAGE UP TO 7,680,000 BITS, 10 MODELS



COMMERCIAL COMPUTER DIVISION

**GP GENERAL
PRECISION**

INFORMATION SYSTEMS GROUP

COMPONENTS BRANCH / 100 E. TUJUNGA AVE.
BURBANK, CALIFORNIA • VICTORIA 9-6061

MAGNETIC DRUMS:

**RUGGED, MILITARIZED DESIGN
AND PRECISION OPERATION... NOW
AVAILABLE FOR COMMERCIAL,
INDUSTRIAL, AND GOVERNMENTAL
APPLICATIONS AT COMPETITIVE PRICES!**

The design of General Precision's magnetic storage drums is based on the company's long experience in developing and manufacturing dependable drums for the Navy, the Air Force, and the National Aeronautics and Space Administration (NASA).

FOR THE NAVY—In the shipboard fire control system for the ASROC antisubmarine weapon... and in the CP-209 bombing and navigation computer used in carrier-based attack bombers.

FOR THE AIR FORCE—In the AN/ASN-24(V) computer for the new C-141 StarLifter jet transport... for navigation, airdrop, and other critical control functions.

FOR NASA—In the AN/ASN-24 computer selected to control the propulsion and guidance operations for the Centaur rocket/spacecraft during its flyby probes of the moon, Mars, and Venus.

DESIGN

Each General Precision Series L500 magnetic drum (a) is a fixed-head unit with an integral air circulation system, a unique read-record head design, super precision bearing assemblies, and an integral induction motor drive.

By maintaining a constant flow of air through the drum and head housing, the air circulation system (b) protects the entire assembly from the detrimental effects of thermal shock. Air flow is from top to bottom, with simultaneous circulation through the hollow drum interior and the narrow circular gap between the drum and its surrounding head housing.

Inlet holes are located in the top of the housing and in the top plate of the drum. Outlets are provided by slots in the drum's base plate and holes near the bottom of the housing. Air is drawn through the assembly by the curved radial slots in the drum's base plate; as the drum rotates, the fan-shaped configuration of the slots automatically converts the base plate into an impeller. Together with a thermal shroud that envelops the entire assembly, the air circulation system insures that the drum and housing will remain at the same temperature at all times.

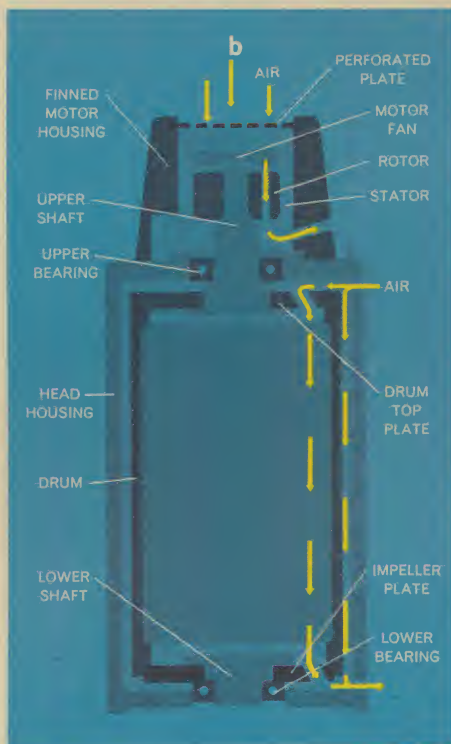
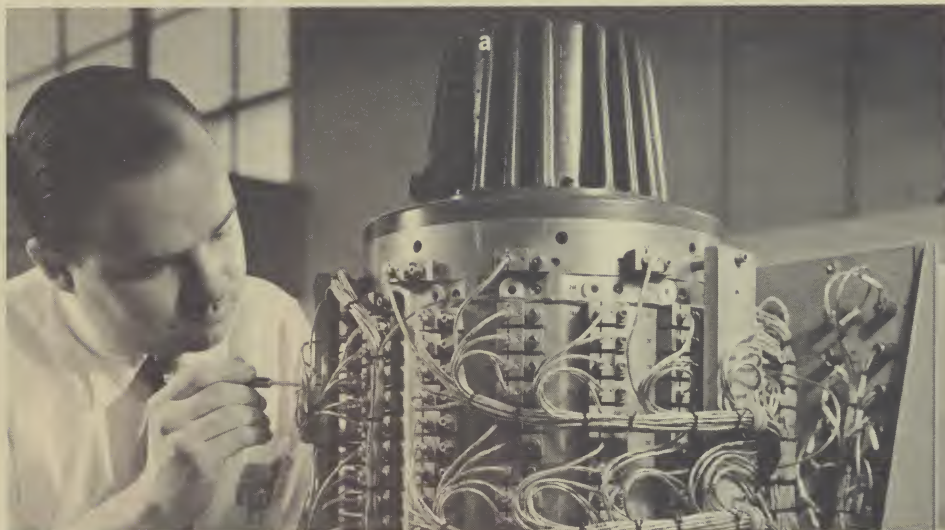
All Series L500 drums are designed to perform flawlessly under the following thermal conditions:

Ambient air temperature, +60°F to +140°F
Temperature shock,
28° variation at 4°/minute
Nonoperating limits, -65°F and +165°F

All materials, fits, and design proportions are selected to compensate for and annul the effects of the temperature differentials, vibration conditions, and mechanical shocks to which the drums may be exposed.

READ/RECORD HEADS

The cylindrical heads (c) used in General



Precision magnetic drum assemblies are dimensionally stable throughout the temperature operating range of the drums themselves.

Each head is held in place by a simple but rugged collet (d) whose positive clamping action (e) prevents any motion or creep of the head relative to the coated surface of the drum.

Accuracy of settings is assured by precision dial indicators that act on the lead ends of the heads. The head setting procedure also compensates for centrifugal and thermal growth of the drums relative to their housings.

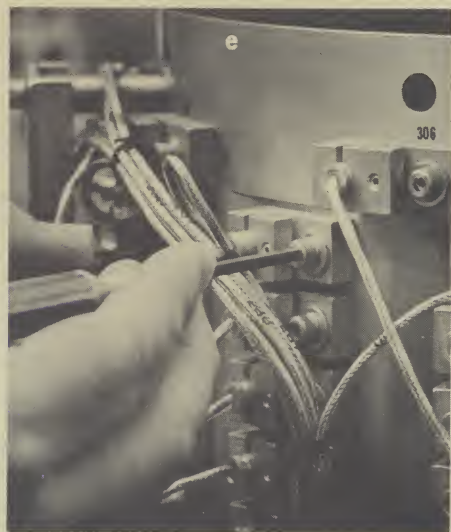
Layout of the heads is such that track-to-track spacing is 0.050 inch (20 tracks per inch). Maximum track width is 0.030 inch, allowing a 0.020-inch guard band between each set of tracks. This feature minimizes any tendency toward fringing effects between recorded tracks, permitting the use of an NRZ recording scheme if desired. All clock and buffer tracks are physically isolated from the general storage tracks.

BEARING ASSEMBLIES

Mechanical simplicity, rugged reliability, and precision design are combined in the bearing assemblies of all General Precision magnetic drums. Rotating about a vertical axis, each drum turns on two preloaded, super precision, angular contact ball bearings, which are grease-lubricated for life (10 years of continuous operation at a constant drum speed of 3600 revolutions per minute).

MOTOR DRIVE

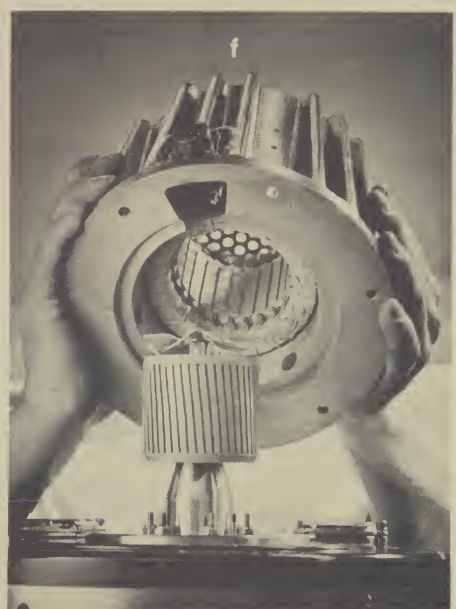
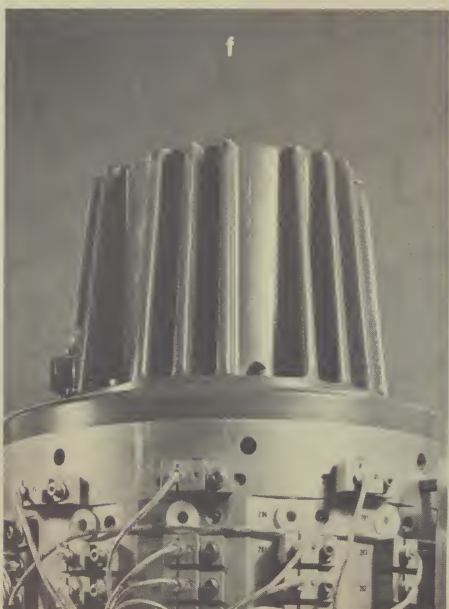
General Precision magnetic drums are driven by induction motors installed in finned housings (f) bolted to the upper bearing plates of the drums. No coupling shafts or belt transmissions are used; each motor shaft is also the upper shaft of the associated drum assembly! Ample cooling for the integral induction motors is provided by air drawn through top and bottom holes of each housing (b) by a



small, four-bladed fan mounted on top of the motor shaft.

For drum speeds ranging from 900 to 3600 revolutions per minute, the motors can be driven by 115-volt, 1-phase, 60-

cycle or 220-volt, 3-phase, 60-cycle power. For higher speeds a 400-cycle source is needed. All motors can easily be serviced or replaced in less than 30 minutes with a minimum of common tools.

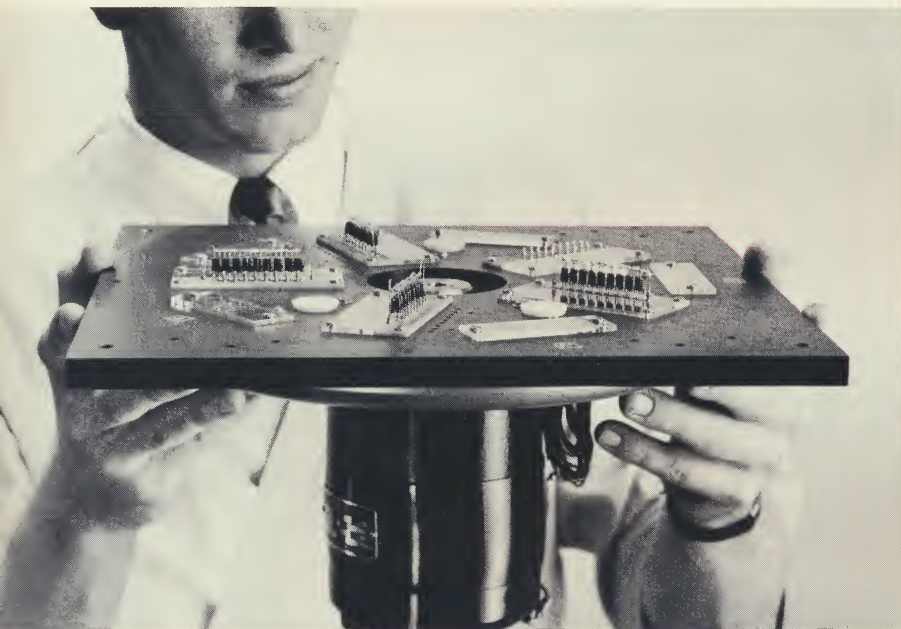


SPECIFICATIONS: SERIES L500 MAGNETIC DRUMS	Model L508		Model L510		Model L516	
	Type 160	Type 320	Type 320	Type 400	Type 400	Type 640
Drum diameter	8"	8"	10"	10"	16"	16"
Drum length	8"	16"	16"	20"	20"	32"
Maximum tracks	160	320	320	400	400	640
Maximum bit capacity	512,000	1,024,000	1,300,000	1,980,000	2,560,000	4,100,000
Maximum bits/track	3200	3200	4096	4096	6400	6400
Drum speed (rpm)	3600-6000	3600	1200-3600	1200-3600	900-1800	900-1800
Bearing life	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 1800 rpm	10 yrs. at 1800 rpm
Over-all dimensions (diameter x length)	16"x 18"	16"x 25"	18"x 25"	18"x 30"	26"x 30"	26"x 42"
Power source	115v, 1 ϕ , 60 $\sim$ or 220v, 3 ϕ , 60 $\sim$ *				220v, 3 ϕ , 60 $\sim$	
Head inductance	70 microhenries					
Type of recording	phase modulation					
Recording surface	0.001" GRIMACO					
Runout	0.0001" T.I.R. maximum					
Head-to-drum spacing	0.001"					
Head setting method	precision indicator					

*Eight-inch drums with 6000 rpm speed require 220v, 3 ϕ , 400~ source.



LIBRASCOPE engineering data



SERIES L-300

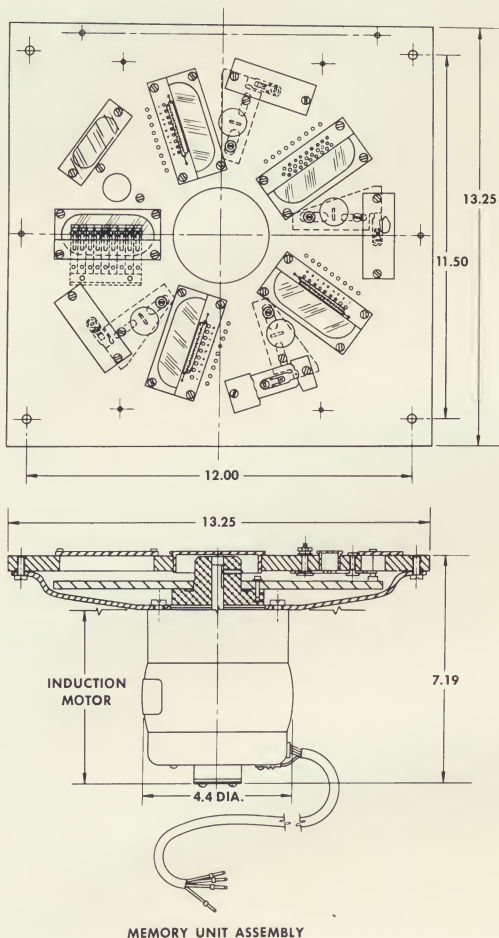
random- access disc memory

DESCRIPTION—Librascope random-access disc memories can be used to provide data storage and transfer in a wide variety of computer systems and peripheral equipment or wherever rapid-access memory is a system requirement. They feature a flying head per track and a nonwearing, plated cobalt recording surface, providing superlative magnetic performance under all conditions of operation. The Series L-300 magnetic storage discs have a maximum capacity of 275,000 bits and are available with an average access time of either 17 or 25 milliseconds.

SPECIAL FEATURES—The superior but simplified disc and head design results in more efficient packaging than has previously been available and in a lower-cost product. The recording disc surface, plated with a cobalt coating, is smooth and long-wearing, unaffected by multiple start-and-stop operations. The flying head is in contact with the metallic recording surface when the disc is not rotating. The inherent hardness of the cobalt plating provides high resistance to abrasive wear and relative insensitivity to accidental damage.

All materials, fits, and design proportions of the basic structure are selected to compensate for the temperature differentials the disc assemblies may encounter in storage and in operation. For strength, rigidity, and lightness of weight, all discs and supporting structures are made of aluminum.

APPLICATIONS—Random-access disc memories are used in computer systems and peripheral equipment as the main storage or buffer storage or they supplement other memory. In a typical computer system, the magnetic disc memory provides an inexpensive, rapid-access, reliable storage with sufficient capacity for many programs. In peripheral equipment such as visual computer displays, they make possible a constant (no-flicker) variable-size display.

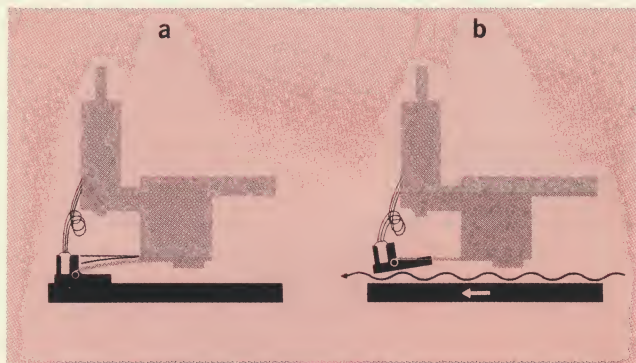


SERIES L-300

random- access disc memory

GENERAL CHARACTERISTICS

Power requirements	115-volt, 60-cycle, single-phase AC
Disc diameter	10 in.
Weight	25 lb.
Axis of rotation	Vert., horiz., or any combination
Recording diameters	4.7 in. to 9.2 in.
Number of tracks	45 (5 groups of 9)
Number of registers	4
Register length	0.25 or 0.5 in.
Register adjustment	± 0.018 in.
Bits per track (max.)	6144 pm recording
Track width	0.034 in.
Tracks per inch	20
Capacity (total)	276,480 bits
Packing density (max.)	400 bits/in. at 4.7 in. dia.
Rotational speed	1200 or 1800 rpm
Frequency (repetition rate)	184kc (max.)
Recording surface	Proprietary plated cobalt
Head spacing	Flying head
Inductance (typical)	1 mh/half coil
Write current (typical)	28 ma
Readback voltage (typical)	1200 rpm 180 mv (min.), inner track 340 mv (max.), outer track
Bearing life (average)	10 years



OPERATION

When a disc is not rotating (a), the heads are held in contact with the metallic recording surface by a reed of bifurcated leaf springs whose tension, for each individual head, can be adjusted by clamping/adjusting screws. In the contact position, the low-friction surface prevents the heads from damaging the disc tracks.

When the disc rotates (b), the heads "fly" over the track, riding on an air cushion approximately 0.0001-inch thick. The design of the heads and their adjustable mountings is such that the head-to-disc gap remains constant during operation; the flying action of the heads automatically compensates for inherent variations in the run-out of the disc and for any unbalanced temperature differentials between the head mounting plate and recording surface of the disc.

Track access is controlled by addressing from electronic switching circuits, control logic circuits, and buffers that are wired to the heads.

LIBRASCOPE GROUP

**GP GENERAL
PRECISION**

COMMERCIAL COMPUTER DIVISION

808 WESTERN AVENUE • GLENDALE 1, CALIF.
Telephone: VI 9-6061

Random Access Magnetic Drums & Discs

DRUM STORAGE UP TO 4,100,000 BITS, 3 MODELS • DISC STORAGE UP TO 7,680,000 BITS, 10 MODELS



COMMERCIAL COMPUTER DIVISION

**GP GENERAL
PRECISION**

INFORMATION SYSTEMS GROUP

COMPONENTS BRANCH / 100 E. TUJUNGA AVE.
BURBANK, CALIFORNIA • VICTORIA 9-6061

MAGNETIC DRUMS:

**RUGGED, MILITARIZED DESIGN
AND PRECISION OPERATION... NOW
AVAILABLE FOR COMMERCIAL,
INDUSTRIAL, AND GOVERNMENTAL
APPLICATIONS AT COMPETITIVE PRICES!**

The design of General Precision's magnetic storage drums is based on the company's long experience in developing and manufacturing dependable drums for the Navy, the Air Force, and the National Aeronautics and Space Administration (NASA).

FOR THE NAVY—In the shipboard fire control system for the ASROC antisubmarine weapon... and in the CP-209 bombing and navigation computer used in carrier-based attack bombers.

FOR THE AIR FORCE—In the AN/ASN-24(V) computer for the new C-141 StarLifter jet transport... for navigation, airdrop, and other critical control functions.

FOR NASA—In the AN/ASN-24 computer selected to control the propulsion and guidance operations for the Centaur rocket/spacecraft during its flyby probes of the moon, Mars, and Venus.

DESIGN

Each General Precision Series L500 magnetic drum (a) is a fixed-head unit with an integral air circulation system, a unique read-record head design, super precision bearing assemblies, and an integral induction motor drive.

By maintaining a constant flow of air through the drum and head housing, the air circulation system (b) protects the entire assembly from the detrimental effects of thermal shock. Air flow is from top to bottom, with simultaneous circulation through the hollow drum interior and the narrow circular gap between the drum and its surrounding head housing.

Inlet holes are located in the top of the housing and in the top plate of the drum. Outlets are provided by slots in the drum's base plate and holes near the bottom of the housing. Air is drawn through the assembly by the curved radial slots in the drum's base plate; as the drum rotates, the fan-shaped configuration of the slots automatically converts the base plate into an impeller. Together with a thermal shroud that envelops the entire assembly, the air circulation system insures that the drum and housing will remain at the same temperature at all times.

All Series L500 drums are designed to perform flawlessly under the following thermal conditions:

Ambient air temperature, +60°F to +140°F
Temperature shock,

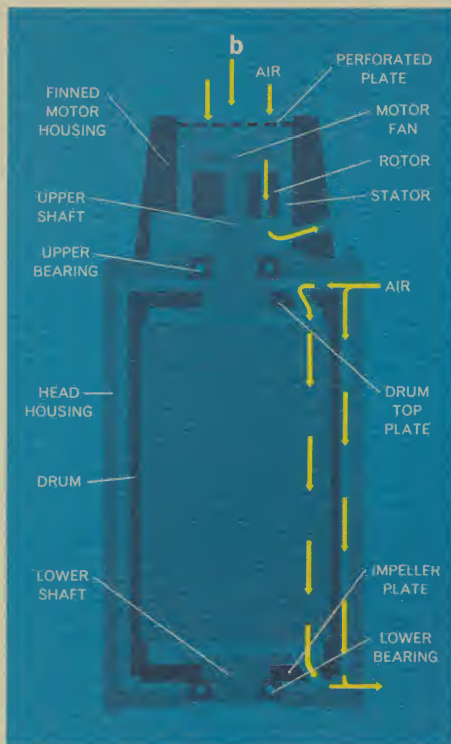
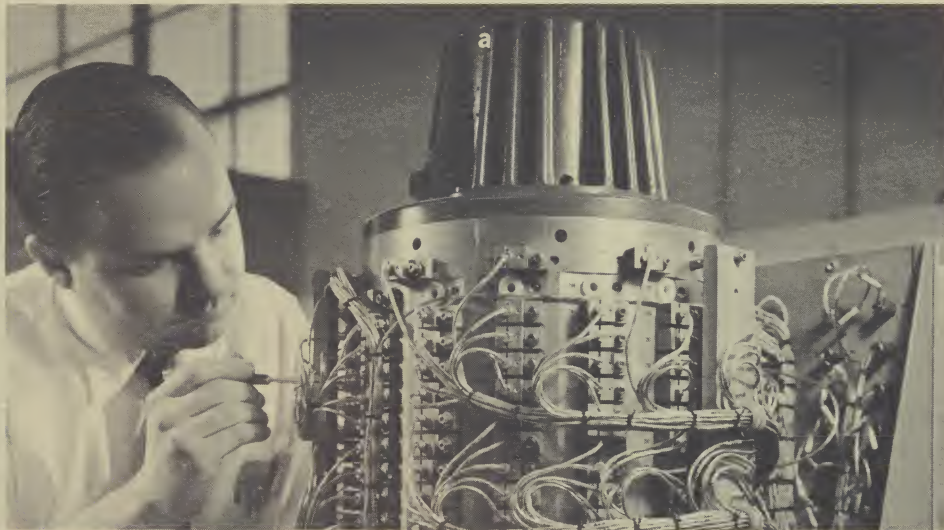
28° variation at 4°/minute

Nonoperating limits, -65°F and +165°F

All materials, fits, and design proportions are selected to compensate for and annul the effects of the temperature differentials, vibration conditions, and mechanical shocks to which the drums may be exposed.

READ/RECORD HEADS

The cylindrical heads (c) used in General



Precision magnetic drum assemblies are dimensionally stable throughout the temperature operating range of the drums themselves.

Each head is held in place by a simple but rugged collet (d) whose positive clamping action (e) prevents any motion or creep of the head relative to the coated surface of the drum.

Accuracy of settings is assured by precision dial indicators that act on the lead ends of the heads. The head setting procedure also compensates for centrifugal and thermal growth of the drums relative to their housings.

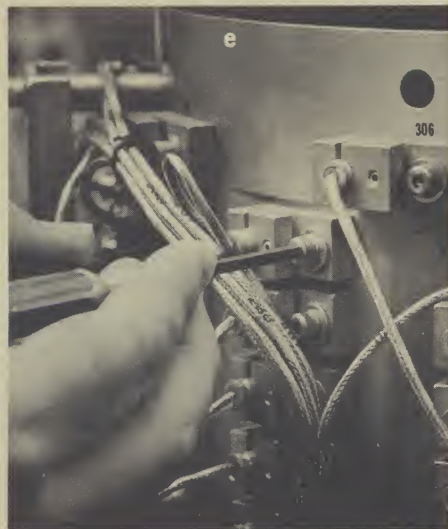
Layout of the heads is such that track-to-track spacing is 0.050 inch (20 tracks per inch). Maximum track width is 0.030 inch, allowing a 0.020-inch guard band between each set of tracks. This feature minimizes any tendency toward fringing effects between recorded tracks, permitting the use of an NRZ recording scheme if desired. All clock and buffer tracks are physically isolated from the general storage tracks.

BEARING ASSEMBLIES

Mechanical simplicity, rugged reliability, and precision design are combined in the bearing assemblies of all General Precision magnetic drums. Rotating about a vertical axis, each drum turns on two preloaded, super precision, angular contact ball bearings, which are grease-lubricated for life (10 years of continuous operation at a constant drum speed of 3600 revolutions per minute).

MOTOR DRIVE

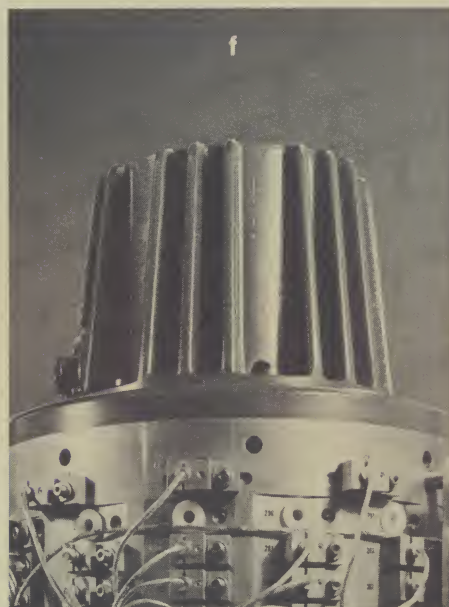
General Precision magnetic drums are driven by induction motors installed in finned housings (f) bolted to the upper bearing plates of the drums. No coupling shafts or belt transmissions are used; each motor shaft is also the upper shaft of the associated drum assembly! Ample cooling for the integral induction motors is provided by air drawn through top and bottom holes of each housing (b) by a



small, four-bladed fan mounted on top of the motor shaft.

For drum speeds ranging from 900 to 3600 revolutions per minute, the motors can be driven by 115-volt, 1-phase, 60-

cycle or 220-volt, 3-phase, 60-cycle power. For higher speeds a 400-cycle source is needed. All motors can easily be serviced or replaced in less than 30 minutes with a minimum of common tools.



SPECIFICATIONS: SERIES L500 MAGNETIC DRUMS	Model L508		Model L510		Model L516	
	Type 160	Type 320	Type 320	Type 400	Type 400	Type 640
Drum diameter	8"	8"	10"	10"	16"	16"
Drum length	8"	16"	16"	20"	20"	32"
Maximum tracks	160	320	320	400	400	640
Maximum bit capacity	512,000	1,024,000	1,300,000	1,980,000	2,560,000	4,100,000
Maximum bits/track	3200	3200	4096	4096	6400	6400
Drum speed (rpm)	3600-6000	3600	1200-3600	1200-3600	900-1800	900-1800
Bearing life	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 3600 rpm	10 yrs. at 1800 rpm	10 yrs. at 1800 rpm
Over-all dimensions (diameter x length)	16"x 18"	16"x 25"	18"x 25"	18"x 30"	26"x 30"	26"x 42"
Power source	115v, 1 ϕ , 60 ~ or 220v, 3 ϕ , 60 ~ *				2 ϕ , 3 ϕ , 60 ~	
Head inductance	70 microhenries					
Type of recording	phase modulation					
Recording surface	0.001" GRIMACO					
Runout	0.0001" T.I.R. maximum					
Head-to-drum spacing	0.001"					
Head setting method	precision indicator					

* Eight-inch drums with 6000 rpm speed require 220v, 3 ϕ , 400~ source.